Three phase variable speed drives for AC motors

VAT2000

VAT2000 is a compact, maintenance free, reliable AC drive for three phase 220-240V or 380-460V power source, allowing high accuracy speed control of standard AC motors.

VAT2000 is an open platform using the latest technology in both hardware and software, providing advanced application functions and full motor protection.

The VAT2000 is a new generation of high performance vector AC drives. Between 10% and 30% smaller than the former range and using the latest 32 bits microprocessors, the new range covers the power ratings from 0.4 to 315kW in constant torque, and up to 370kW in variable torque applications.

As well as satisfying industry's requirement for a top performance drive, the VAT2000 is hailed as a truly environmentally friendly drive. Coupled with a PM motor this drive can offer up to 20% increase in energy efficiency at 2.2kW, saving energy costs. The carefull selection of materials means that the drives plastic components are free of harmful dioxins, and a new soft sound performance significantly reduces noise pollution by randomly altering the carrier frequency during operation.

Removable keypad

Approvals

CE compliance
UL approval (UL508C) 400V series up to U2KX45K0S only.

Features and Benefits

- **All in one Multimode drive:**
  - Sensorless vector control
  - Very high performance vector control with sensor
  - V/F, advanced torque control
  - PM drive
- **Easy to operation:**
  - Rotary knob
  - Autotuning for vector control
  - Removable keypad
- **Environmentally friendly design:**
  - Up to 20% energy saving using a permanent magnet motor
  - Dedicated energy saving function for induction motors
  - Drives plastic components are free of harmful dioxins
  - Soft sound PWM
- **Exceptional pack of monitoring, protection and operating functions**
- **Conform to global standards**

Other features

- **Extended I/O range**
- **Advanced functions**
  - Autotuning
  - Torque control
  - Soft Sound
  - PID control
  - Multipump control
  - Pattern run
  - Programmable speeds
  - Traverse function
  - Skip frequency
  - Speed ratio control
  - «S» shape ramp
- **Communications**
  - Built-in RS485 port
  - Optional Profibus DP interface

Multi-mode vector drive

Mode 1

V/F control for constant torque loads with advanced toruqe control

This mode uses auto-tuning to give voltage vector control in open loop.

The main features of this mode are:

1. Build-in PID controller eliminates the requirement, and cost, of a separate device.
2. Tripless operation. This safe and convenient fetaure is a combination of:
   - the availability of dinamically extend ramp times during operation if the load is likely to demand a too high current or regenerate a higher current than the programmed limit.
   - automating limiting of the IGBT switching frequency if the heatsink temperature rises too high.
   - the ability to limit current transients caused by shock loads.
   - alarms and controlled shutdown in the event of a fault which is non-life threatening of the drive motor.
3. «Motor Loss Braking»is a system which reduces motor efficiency during regenerative braking allowing some of the braking energy to be dissipated from the motor as heat, so reducing the size (or even eliminating) the brake resistor.

Mode 2

V/F control for variable torque loads with advanced torque control

This mode uses auto-tuning to give voltage vector control in open loop with the added benefit that, because of a higher continuous current rating than in constant torque mode, an inverter of one size lower may be used in order to reduce the purchase cost.

Features include:

1. Special energy saving features for fans and pumps where V/F ratios are dynamically controlled to optimise the power usage.
2. The drive can auto-tune to two independent motors, so that one inverter can be used in apllications such as pumping where a main and standby pump are fed by the same source.
3. Multi-pump control. This is a logogic control system commonly used where two or more pumps maintain pressure in a system, one being variable speed abd the others being brought in as required.

Mode 3

Sensorless vector control

There are many drives which claim to offer sensorless vector control but we feel that this term is misused and describes a control system similar to our standard Advanced Torque Control. We define true Sensorless Vector Control as Flux Vector Control without encoder. Closed loop vector control requires the use of an encoder so that shaft position can be used in order to calculate and control phase angle and shaft speed. Because of this, all settings within a closed loop environment relate to actual shaft rotation rather than output frequency.

Developing a method whereby the shaft rotation can be calculated by very closely monitoring the waveform and feedback at three output phases of the drive. All of the settings the VAT2000 in sensorless vector mode are therefore set using rotational speed and not output frequency.

In addition, incorporate two current loops to control magnetising current independently. Thus, the VAT2000 can perform almost as well as a closed loop system and uniquely provide torque at zero speed.

Mode 4

Closed Loop Vector Control

This advanced mode enables motor speed to be varied across a 1000 : 1 speed range, with 0.01% accuracy up to 6 times faster than conventional drives (30Hz response time).

In addition to outstanding torque performances, this mode contains a new feature whereby the loss of the encoder signal will cause the drive to automatically switch into Sensorless Vector mode. The drive then issues an alarm signal which can be used as an indicator or as a shutdown signal.

Closed Loop Vector Control requires an Encoder Feedback card.

Mode 5

PM Motor Control

This mode enables the use of ultraefficient PM motors for energy conservation.

VAT2000

Input voltage	Heavy duty / Constant torque (1) overload 150% 60 sec.			Light duty / Variable torque (2) overload 120% 60 sec.			Protection degree	Cat. no.	Ref. no.
	Input power kVA	Output current A	Maximum (3) motor power kW	Input power kVA	Output current A	Maximum (3) motor power kW			
3ph 200V - 230V	1	3	0.4	1.2	5	0.75	IP20	**U2KN00K4S**	168000
	1.7	5	0.75	2.1	8	1.5	IP20	**U2KN00K7S**	168001
	2.7	8	1.5	3.0	11	2.2	IP20	**U2KN01K5S**	168002
	3.8	11	2.2	5.1	16	4	IP20	**U2KN02K2S**	168003
	5.5	16	4	7.6	22	5.5	IP20	**U2KN04K0S**	168004
	8.3	24	5.5	10.0	33	7.5	IP20	**U2KN05K5S**	168005
	11.4	33	7.5	14.5	42	11	IP20	**U2KN07K5S**	168006
	15.9	46	11	19.3	61	15	IP20	**U2KN11K0S**	168007
	21.1	61	15	24.2	76	18.5	IP20	**U2KN15K0S**	168008
	26.3	76	18.5	29.7	86	22	IP00	**U2KN18K5S**	168009
	31.8	92	22	37.4	108	30	IP00	**U2KN22K0S**	168010
	41	118	30	45	134	37	IP00	**U2KN30K0S**	168011
	50	144	37	55	161	45	IP00	**U2KN37K0S**	168052
3ph 380V - 460V	1	1.5	0.4	1.7	2.5	0.75	IP20	**U2KX00K4S**	168024
	1.7	2.5	0.75	2.5	3.6	1.5	IP20	**U2KX00K7S**	168025
	2.5	3.6	1.5	3.8	5.5	2.2	IP20	**U2KX01K5S**	168026
	3.8	5.5	2.2	5.9	8.6	4	IP20	**U2KX02K2S**	168027
	5.9	8.6	4	9.0	13	5.5	IP20	**U2KX04K0S**	168028
	9	13	5.5	11.7	17	7.5	IP20	**U2KX05K5S**	168029
	11.7	17	7.5	15.9	23	11	IP20	**U2KX07K5S**	168030
	15.9	23	11	21.4	31	15	IP20	**U2KX11K0S**	168031
	21.4	31	15	25.6	37	18.5	IP20	**U2KX15K0S**	168032
	25.6	37	18.5	30.4	44	22	IP20	**U2KX18K5S**	168033
	30.4	44	22	41.5	60	30	IP00	**U2KX22K0S**	168034
	41.5	60	30	50.5	73	37	IP00	**U2KX30K0S**	168035
	50	72	37	55	84	45	IP00	**U2KX37K0S**	168036
	60	87	45	75	108	55	IP00	**U2KX45K0S**	168037
	75	108	55	100	147	75	IP00	**U2KX55K0S**	168038
	100	145	75	120	179	90	IP00	**U2KX75K0S**	168039
	120	173	90	140	208	110	IP00	**U2KX90K0S**	168040
	150	214	110	170	242	132	IP00	**U2KX110KS**	168041
	170	245	132	200	293	160	IP00	**U2KX132KS**	168042
	220	321	160	250	365	200	IP00	**U2KX160KS**	168043
	300	428	200	330	479	250	IP00	**U2KX200KS**	168044
	350	519	250	400	581	315	IP00	**U2KX250KS**	168045
	400	590	315	450	651	370	IP00	**U2KX315KS**	168046
3ph 400V	1	1.5	0.4	1.7	2.5	0.75	IP54	**U2KX00K4SP54B**	169471
	1.7	2.5	0.75	2.5	3.6	1.5	IP54	**U2KX00K7SP54B**	169472
	2.5	3.6	1.5	3.8	5.5	2.2	IP54	**U2KX01K5SP54B**	169473
	3.8	5.5	2.2	5.9	8.6	4	IP54	**U2KX02K2SP54B**	169474
	5.9	8.6	4	9.0	13	5.5	IP54	**U2KX04K0SP54B**	169475
	9	13	5.5	11.7	17	7.5	IP54	**U2KX05K5SP54B**	169476
	11.7	17	7.5	15.9	23	11	IP54	**U2KX07K5SP54B**	169477
	15.9	23	11	21.4	31	15	IP54	**U2KX11K0SP54B**	169478
	21.4	31	15	25.6	37	18.5	IP54	**U2KX15K0SP54B**	169479
	25.6	37	18.5	30.4	44	22	IP54	**U2KX18K5SP54B**	169480
	30.4	44	22	41.5	60	30	IP54	**U2KX22K0SP54B**	169481
	41.5	60	30	50.5	73	37	IP54	**U2KX30K0SP54B**	169482
	50	72	37	-	-	-	IP54	**U2KX37K0SP54C**	169483
	-	-	-	55	84	45	IP54	**U2KX37K0SP54V**	169484
	60	87	45	-	-	-	IP54	**U2KX45K0SP54C**	169485
	-	-	-	75	108	55	IP54	**U2KX45K0SP54V**	169486

(1) Heavy duty / Constant torque ratings

- Ambient temperature -10ºC to 50ºC for all range (IP54 range up to 40ºC)
- Drives up to U2KN22K0S or up to U2KX30K0S allow specified current ratings when carrier frequency is set up to 10KHz. Above 10KHz, derate output current by 7% per 1KHz.
- Drives above U2KN22K0S or U2KX37K0S and above allow specified current ratings when carrier frequency is set up to 4KHz. Above 4KHz, derate output current by 7% per 1KHz

(2) Light duty / Variable torque ratings

- Ambient temperature -10ºC to 50ºC (IP54 up to 40ºC). Fro drives up to U2KN7K5S derate output current by 2% per 1ºC if ambient temperature exceeds 40ºC
- Maximum recommended carrier frequency is 4KHz. Higher carrier frequency is allowed if drive's output current is derated according following expression:

  $\frac{VT - CT}{6}$ Amps, per 1KHz

  VT = Drive rated current in variable torque
  CT = Drive rated current in constant torque
- Ratings are given for standard four poles motors. Otherwise, check motor nameplate

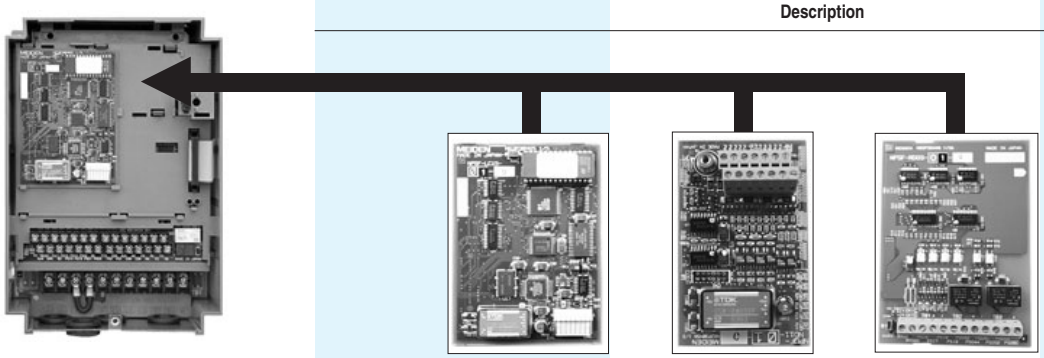
Remark: More information is given in Product Manual

(3) Ratings given are for standard 4 poles induction motors

DC supply drives for common bus operation

We can supply VAT2000 drives for common bus operation DC supply 270-360VDC or 520-720VDC.
Please ask your dealer for more information.

Optional PCBs Cards



	Description	Cat. no.	Ref. no.
Encoder interface	12V A/B phase 60kHz; 6V single phase 20kHz, 12VDC 100mA supply output	**U2KV23DN1**	168087
	5V A/B phase differential 250kHz; 5VDC 200mA 5VDC 100mA supply output	**U2KV23DN2**	168088
	5V 6 phase (A, B, Z, U, V, W) 250Hz for permanent magnet motors 5VDC 100mA supply output	**U2KV23DN3**	168089
Relay interface	4 additional programmable inputs 2 additional programmable relay outputs	**U2KV23RY0**	168090
Parallel interface	Frequency setting through parallel 8/12/16 data bits	**U2KV23PI0**	168091
Serial communication interface	Additional RS232C/485 serial port	**U2KV23SL0**	168092
Profibus DP communication interface	Standard field bus interface	**U2KV23SL6**	168093

Accessories

Extension cable for keypad	3 m	**U2KV23W103**	168102
Extension cable for keypad	1 m	**U2KV23W101**	168103
Drive to terminals RS485 cable		**U2KV23W123**	168104
Drive to 15 pin D-sub connector RS485 cable		**U2KV23W113**	168105
Drive to PC RS232 cable	Includes RS232/485 converter	**U2KV23CNVKIT**	168106

Technical data

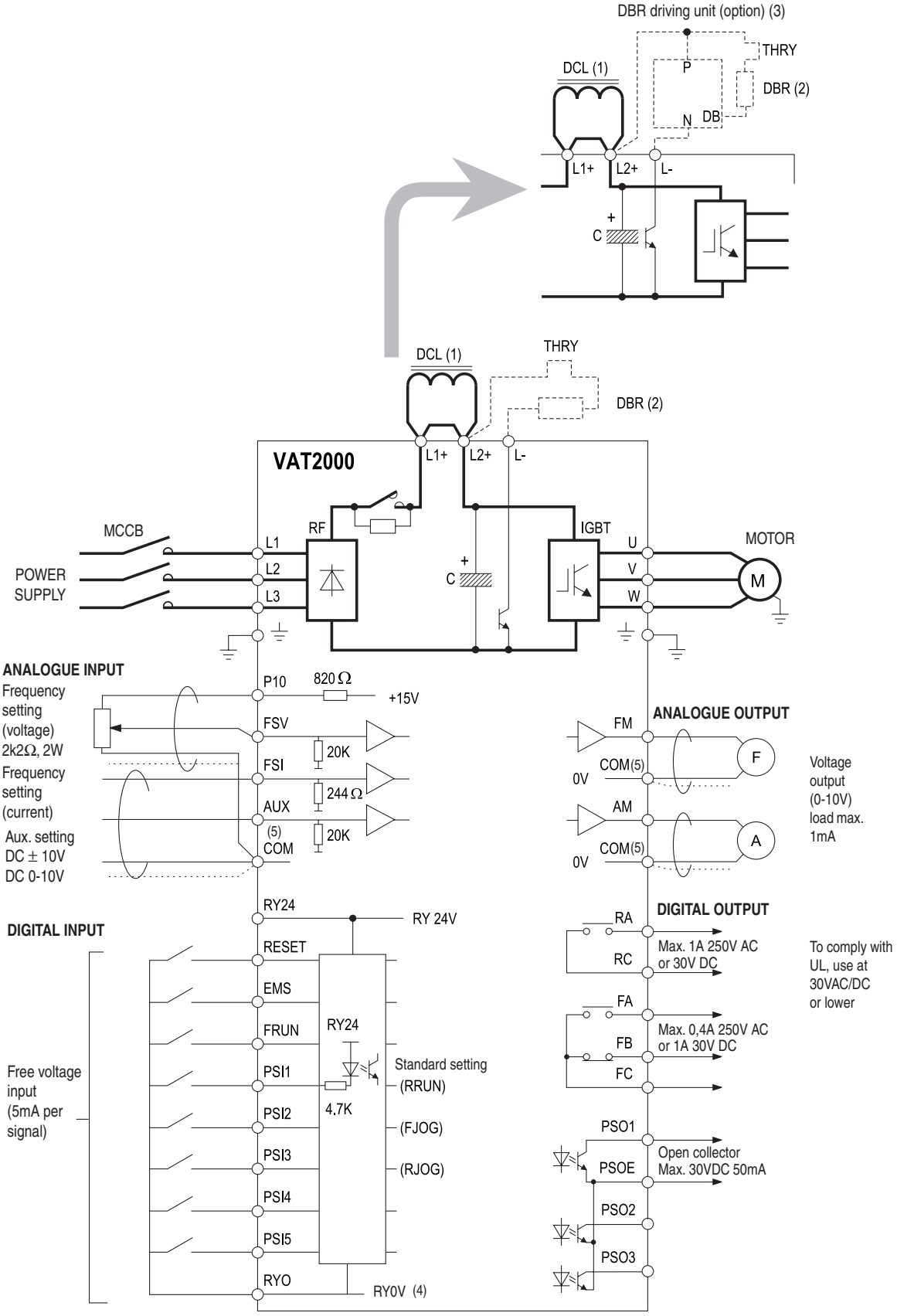
Frequency control			
Control method	All digital control sine wave approximation PWM		
Carrier frequency			
Mono-sound mode	1 to15kHz (1kHz increments) 1 to 8kHz for drives above U2KX45K0S		
Soft sound mode	Average frequency 2.1 to 5kHz with 3 or 4 tone modulation		
Output frequency resolution	0.01Hz		
Frequency setting resolution			
Digital	0.01Hz		
Analogue	0.025%, respect maximum frequency		
Frequency accuracy			
Digital	± 0.01% at 25 ±10ºC		
Analogue	± 0.1% at 25 ±10ºC		
Output frequency	From 0 to 440Hz in V/f control mode From 0 to 120Hz in Vector control mode		
Control specifications			
Voltage frequency control	Constant torque, constant output and reduction torque set in range from 3 to 440Hz Torque Boost: Manual and automatic Max. torque boost: allows improved V/f control		
Vector control	**Sensorless**	**With sensor**	**For PM motors**
Control range	1 : 100	1 : 1000	1 : 100
Constant output range(*)	Up to 1 : 2	Up to 1 : 4	Up to 1 : 1.2
Speed accuracy (at Fmax.⊕50Hz)	± 0.5%	± 0.01%	± 0.01%
Control response	5Hz	30Hz	-
Automatic tuning	Automatic measurement of motor constants and setting of critical parameters. There are two independent Auto-tuning for all control modes.		
Starting torque	200% or more		
Acceleration/deceleration time	0.01 to 60000 sec. Two sets of independent acceleration/deceleration, plus one set for jogging and eight sets more for program ramp function		
Acceleration/deceleration mode	Linear and S type ramp selection		
Operating system (3 modes selectives)	- Forward run or reverse run using two external dry contacts - Run/Stop and forward/reverse changeover using two external dry contacts - Forward/Reverse run and stop using three external push-buttons		
Stop system	Selectable either Ramp down to stop or coast to stop, idependently for run, jog and EMS		
DC braking	- Braking stop frequency, set between 0.1 and 60.0Hz - Braking voltage, set between 0.1 and 20.0% - Braking time, set between 0.0 and 20.0 s.		

(*) from 150 to 7200 rpm (max. 120Hz)

Technical data *(continued)*

Operation functions	
Multi speed	8 fixed speed selectable with independent acceleration/deceleration ramps for each speed
Ratio interlock	Output frequency or speed is operating according: Y = Ax + B + C x : frequency or speed setting A : (gain) 0.000 to ±10.000 B : 0.00 to ± 440Hz (0 to ±7200min^{-1} with max.:120Hz in Vector control mode) C : auxiliary input (AUX) Upper and lower limits available
Frequency jump	Up to three areas / Width can be varied between 0.0 and 10Hz
Slip compensation	Slip compensation gain for V/f operation only from 0.0 to 20.0%
Auto-run function	10-step automatic run function / Synchronous / Asynchronous selective
Others	PID, Pick-up, Auto-start, Traverse, Multipump control, reverse run protection and Restart after instantaneous power failure
External I/O	
Operation keypad	Detachable IP54 unit with 5 digit LED display and eight status LED signals. Includes three set keys and fast tuning knob system. Door mountable by 3m extension cable
Input sequence	Three fixed inputs and five programmable to more than 30 functions
Output sequence	One fixed dry contact (fault), one dry contact and three open collector outputs all programmable to more than 20 functions, like speed detection precharging, reverse run, speed reached, direction, current reached, speed, acceleration, fault code, etc
Frequency settings	FSV: 0 to 10V / 0 to 5V / 1 to 5V FSI: 4 to 20mA / 0 to 20mA AUX: 0 to ±10V / 0 to ±5V / 1 to 5V Source potentiometer: 10V DC (2k2Ohms)
Meter outputs	Two 0-10V programmable with output frequency, voltage, current, DC voltage, etc
Protection features	
Prevention	Overcurrent and Overvoltage limit, Overload warning signal
Trip	Overcurrent, overvoltage, undervoltage, IGBT fault, overload, temperature rise, ground fault, other self-diagnosis
Fault history	The last four faults are recorded including in each: main cause, secondary cause, output current and output frequency at the fault time
Overload level	CT: 150% for 1 minute, 170% for 2,5 seconds VT: 120% for 1 minute, 125% for 1second For frequencies below 1Hz, overload of 75% during 60 seconds
Retry	Automatic reset after a fault. Adjusable from 0-10 tries
Operating environment	
Installation	Indoor, with atmosphere free from corrosive or explosive gases, dust, steam or oil mist
Working temperature	-10 to +50ºC
Relative humidity	max. 95% RH, non condensing
Altitude	1000 m. max.
Vibrations	4.9 m/s^2

I/O wiring



(1) Remove the link between L1 - L2 it using optional DC reactor
(2) Dynamic braking included for drives up to U2KN7K5S and U2KX7K5S
(3) Dynamic braking for drives U2KN11KS, U2KX11KS and larger is performed with external dynamic braking units
(4) No connection shell be made between RY0V and COM since this section is insulated
(5) Three COM terminals are internally connected

Notes

I/O terminal board specifications

	Terminals	Function	Description
Control terminal board			
Digital inputs	**RY0, RY24**	Relay input common	This is a common terminal for relay input signals specified below
	PSI1 ~ PSI5	Programmable inputs	These inputs can be arbitrarily set to any of input sequence functions
	EMS	Emergency stop	If EMS is ON while the VAT2000 is stopped, all operational commands are cancelles. If it is ON during operation, the VAT2000 is led into stopping sequence (ramp down stop or coast-to-stop are available. It is also possible to output this signal as a fault (FLT).
	RESET	Fault reset	A faulty condotion is reset. With this signal, a fault status output (FLT LED, FAULT relay operation) is turned OFF and operation becomes possible
	RUN	Forward run	This is a command for forward run. Run/Reverse mode by permanent or pulse command can be selected
Analogue inputs	**FSV**	Voltage/Frequency	This is mainly used for setting frequency (speed). The maximum speed setting is available at 10V input. This input is valid when VFS function is ON
	FSI	Current/Frequency	This is mainly used for setting frequency (speed). The maximum speed setting is available at 20mA input. This input is valid when IFS function is ON
	AUX	Auxiliary input	This is mainly used for setting frequency (speed). The maximum speed setting is available at ±10V input. This setting is valid when AUX function is ON
	COM	Analogue input common	This is a common terminal for FSV, FSI and AUX signals
Analogue outputs	**FM**	Frequency meter	This is a voltage output signal for a frequency meter. In a standard mode, a 10V output is available at the maximum frequency. This output voltage can be adjusted to 0.2 to 2.0 times 10V (max. output is, however, approximately 11V). Internal parameters other than those of frequency can also be output (C13-0, C14-0)
	AM	Ammeter	This is a voltage output signal for ammeter. In a standard arrangements, an output of 5V is available for the rated current. This output voltage adjustment of 0.2 to 2.0 times of 5V is also available. Internal parameters other than those of current can also be output
	COM	Analogue output common	This is a common terminal for a frequency meter and ammeter
	P10	FSV source	This is a 10V source used when a potentiomenter is connected to the FSV input circuit The potentiometer should be of 2W and 2k2Ω
Digital outputs	**RC, RA**	RUN	Dry relay contact assigned to RUN function as default. Programmable to other functions as well
	FC, FA, FB	FAULT	Dry relay contact assigned to FAULT function. It operates when a fault occur
	PS01	READY	Programmable open collector output assigned to READY function as default
	PS02	Current detection	Programmable open collector output assigned to current detection function as default
	PS03	Frequency speed	Programmable open collector output assigned to speed detection as default attainment
	PS0E	Open collector output common	This is a common terminals for the PS01, 2 and 3 outputs All digital outputs can be set to any of output sequence functions
Input sequence functions			
	R RUN	Reverse run	This is a command for reverse run
	F JOG, R JOG	Forward/Reverse jogging	These are jogging commands. If this signal is ON while RUN is OFF, operation then conforms to the setting of jogging (A00-1 or 3). For stopping, either ramp down stop or coast-stop is available
	HOLD	Hold	This is a stop signal used when Forward/Reverse command is operated by push-buttons
	BRAKE	DC brake	DC brake can be operated with this signal
	C SEL	Ramp selection	Accel./decel. ramp performance is switched over. ACCel./Decel. time 2 (B10-0, 1) is available with ON, and Accel./Decel. time 1 (A01-0, 1) is available with OFF
	I PASS	Ratio interlock bypass	Ratio interlock operation is bypassed
	VFS	Speed setting 1	Enables frequency (speed) setting from analog input FVS (C07-0)
	IFS	Speed setting 2	Enables frequency (speed) setting from analog input IFS (C07-1)
	AUX	Speed setting 3	Enables frequency (speed) setting from analog input AUX (C07-2)
	PROG	Program functions	Used for multiple speed setting. Selection of up to 8 fixed speed (PROG0 ~ PROG7) is made with S0 ~ S3, SE
	CFS	CPU setting	Enables frequency (speed) setting for a serial port
	S0 to S3, SE	Program setting	When PROG is ON, the program frequency (8 fixed speeds) (B11-0 up to 7) is enabled. BCD or direct speed selection are allowed (B11-8)
	FUP	Frequency up	Raises the output frequency or motor speed (A00-0, A00-2)
	FDW	Frequency down	Decreases the output frequency or motor speed
	BUP	Bias up	Raises the output frequency set through PROG function
	BDW	Bias down	Decreases the output frequency set through PROG function
	IVLM	Bias ratio control	Enables BUP or BDW functions
	AUXDV	Dual settings	Enables secondary settings (dual motor operation)
	PICK	Pick-up	While this signal is ON, pick-up operation is effected as soon as RUN or R RUN is ON
	EXC	Pre-excitation	Allows pre-excitation, establishing flux in the motor without generating torque
	ACR	ACR	Enables ACR operation
	PCTL	P control	ASR control is changed from the PI control to the P control
	COP	CPU operation	Enables command control from the serial port
	LIM 1	Drive torque limiter	The drive torque is limited by the analog input or serial transmission when enabled
	LIM 2	Regenerative torque lim.	The regenerative torque is limited by the analog input or serial transmission when enabled
	CPASS	Ramp bypass	The ramp function is bypassed when CPASS is enabled
	MCH	MAchine time constant	Enables machine time constant compensation in ASR block
	RF0	0 setting	The speed setting is changed to 0 rpm.
	TRQB1	Torque bias 1	The torque bias input 1 is enabled
	TRQB2	Torque bias 2	The torque bias input 2 is enabled
	DROOP	Drooping changeover	Enables Drooping function (B13-5)
	DEDB	Dead band setting	The dead band setting of ASR is enabled (B14-0)

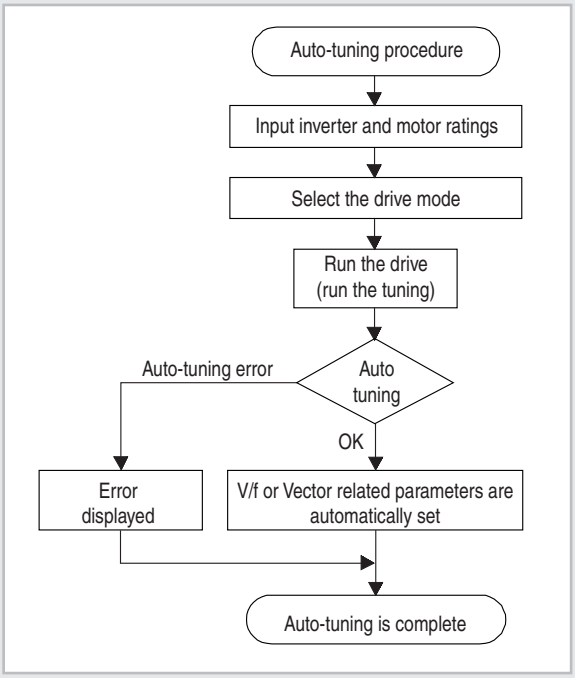
I/O terminal board specifications *(continued)*

	Terminals	Function	Description
Output sequence functions			
	RUN	Run	This turns ON during running, jogging or DC braking (C00-7)
	FLT	Fault	This turns ON during a fault
	MC	Charge completed	This turns ON when the DC main circuit voltage reaches right voltage level at power ON
	RDY1	Ready (1)	This turns ON when there is no fault, EMS is not activated, and pre-charging is completed
	RDY2	Ready (2)	This turns ON when there is no fault, EMS is activated and pre-charging is completed
	LCL	Local	This turns ON when the operation mode is local (operation from the operation panel)
	REV	Reverse run	This turns ON while the motor is reverse running
	IDET	Current detection	This turns ON when the output current reaches the detection level (C15-1) or higher
	ATN	Speed attainment	This turns ON when the output frequency (speed) reaches the set frequency (speed) (C15-0)
	SPD1	Speed detection (1)	This turns ON when the output frequency (speed) reaches the speed set level (C15-2)
	SPD2	Speed detection (2)	This turns ON when the output frequency (speed) reaches the speed set level (C15-3)
	COP	CPU control	This turns ON when serial transmission operation is selected
	EC0~EC3	Fault code 0 to F	After a fault this outputs the fault code with a 4-bit binary format
	ACC	Acceleration	This turns ON during acceleration
	DCC	Deceleration	This turns ON during deceleration
	AUXDV	Dual selection	This turns ON when the secondary drive parameter setting is validated
	ALM	Minor fault	This turns ON during a minor fault
	FAN	Fan control	This turns ON during running, jogging, pre-excitation and DC braking. A three minute off delay is provided, so even if the above operations turn OFF, this control will not turn OFF for three minutes. This is used for external fan control
	ASW	Auto-start wait	This is ON while Auto-start delay time (C08-0)
	ZSP	Zero speed	Tis turns ON when the output frequency (speed) is below the level set with (C15-4)

Remark: ON means contact is closed

Auto-tuning

The VAT2000 is performed with an Auto-tuning function which simplifies the adjustment of critical control parameters. The Automatic tuning can be performed in four mode of operation, V/f Constant Torque, V/f Variable Torque, Vector Sensorless, Full Vector with sensor.



Drive and motor ratings

B00/1-0	Input voltage (V)
B00/1-1	Motor rated output voltage (kW)
B00/1-2	Number of motor poles (Pole)
B00/1-4	Max. speed (min-1)
B00/1-5	Base speed (min-1)
B00/1-6	Motor rated current (A)
B00/1-7	Carrier frequency
B01-8	Number of encoder pulses (P/R)

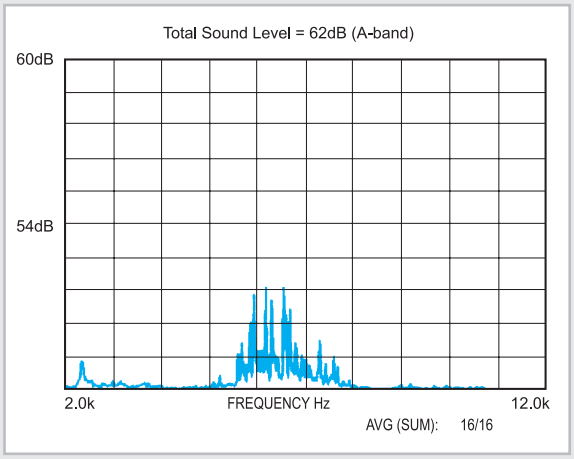
Drive mode

C30-0 = 1	V/f Constant torque
C30-0 = 2	V/f Variable torque
C30-0 = 3	Vector sensorless
C30-0 = 4	Full vector
C30-0 = 5	PM motor control

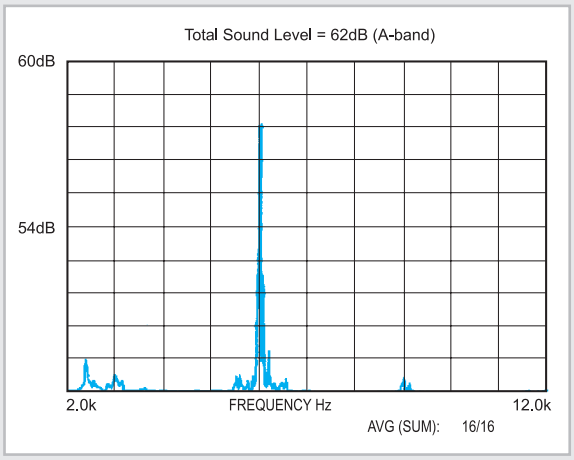
Soft Sound

VAT2000 Soft Sound technology reduces the characteristic whine from inverter-driven motors and eliminates the side-effects of conventional noise reduction methods, specifically that of raising the carrier frequency.
Soft Sound varies the carrier frequency in one of two fixed patterns, from a user-selected base frequency (between 2.1kHz and 5kHz). By keeping the carrier frequency range low, torque performance is notably better tha a high-frequency carrier.
The high frequency induced problems of hot running, degrading of winding insularion, arcing across motor bearings, high leakage currents, interference,.... These are decreased by using Soft Sound carrier frequency.

Soft Sound

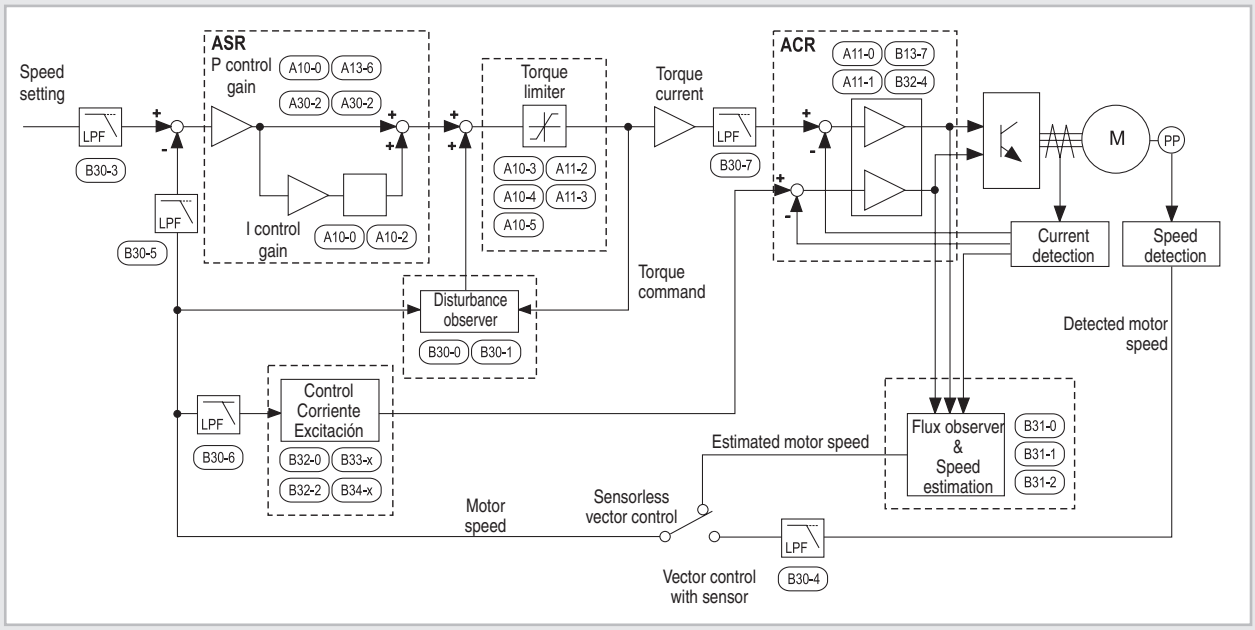


Mono Sound



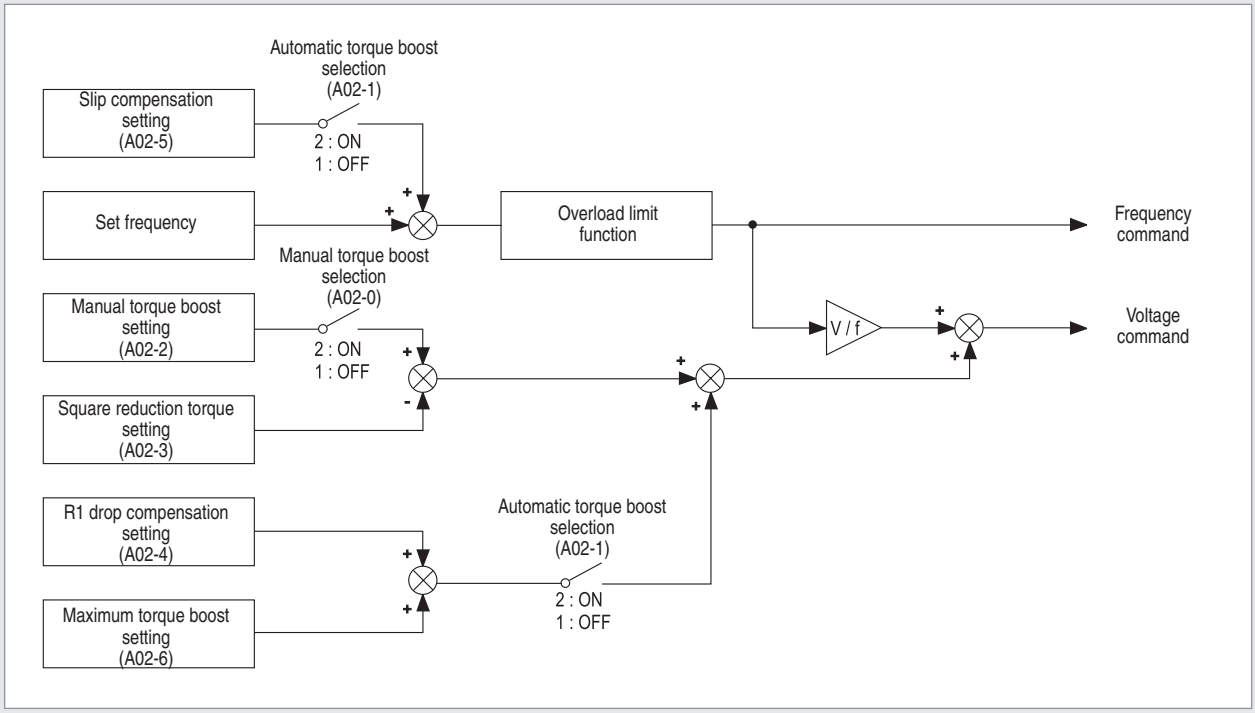
Vector control system. Speed block diagram

The VAT2000 performs an high-end Vector control system, which allows speed accuracy up to 0.01% using encoder feedback, and up to 0.5% in sensorless. The dynamic response is excellent in all cases.
The speed control block diagram is given below



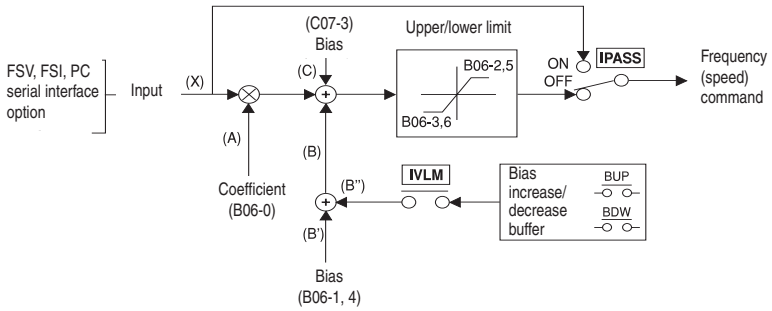
V/f Control. ATC system

The VAT2000 includes an ATC (Advanced Torque Control) function, which improves the starting torque in the traditional V/F control systems allowing up to 200% torque with standard induction motors. The Automatic tuning function set automatically drive parameters, avoiding difficult manual adjustments.
The ATC block diagram is given below



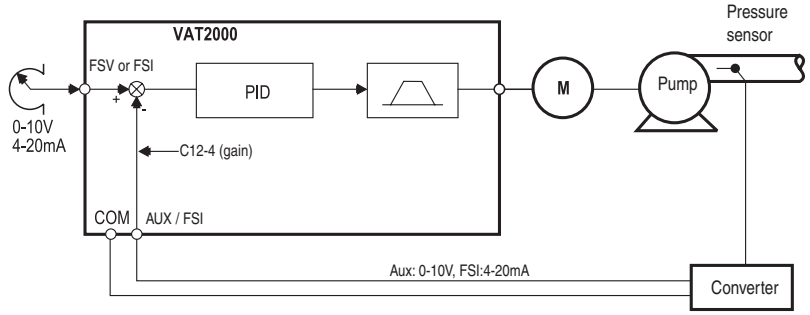
Ratio interlock function

This function allows full control ratio of speed setting and motor speed. Useful to synchronize several motors at different speed ratio. Ratio interlock setting function includes up/down limits, up/down speed setting increments and co-ordination between two analogue inputs.



PID Control

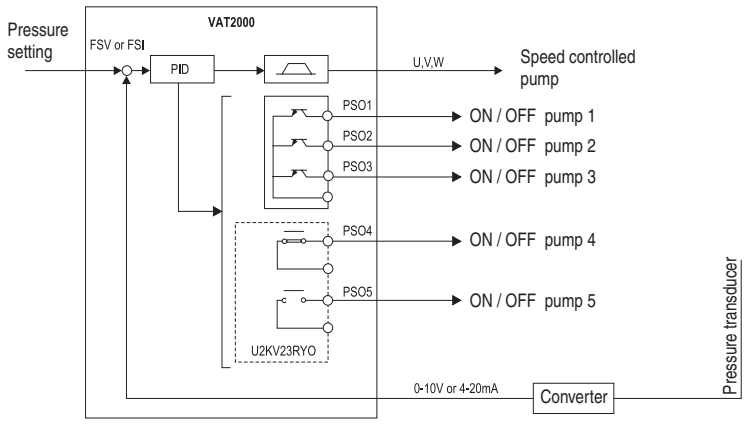
This function allows control of external conditions by using a feed-back signal. Useful for slow process control like water pressure or flow, temperature by fans, etc

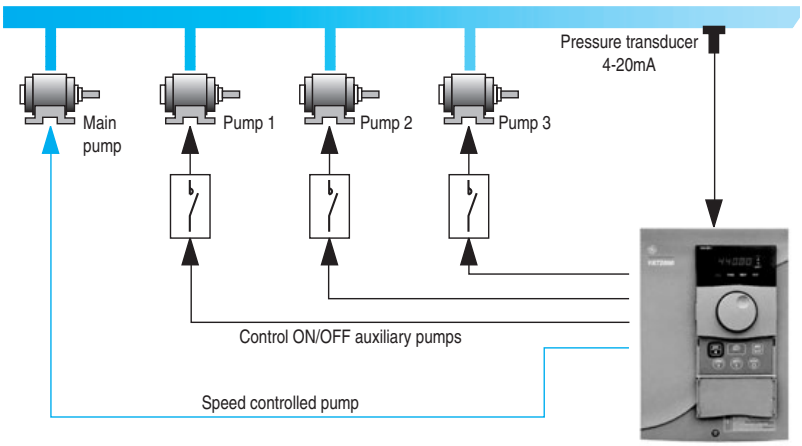


Multi-pump control

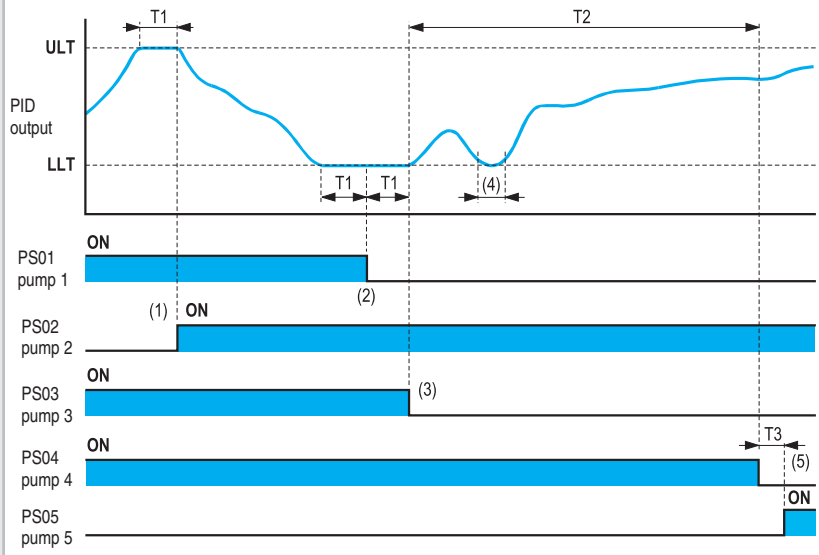
One pump is variable speed controlled and up to five more controlled ON/OFF by the digital outputs provided in the VAT2000. The water pressure in the pipe system is controlled to be constant according the setting input in the VAT2000's PID. The pumps are automatically shifted in order to ensure same average working time. As standard the drive provide control up to 3 ON/OFF controlled pumps. By using optional card U2KV23RY0, then operation is allowed up to 5 pumps.

Example of system configuration (when operating five ON/OFF control pumps)

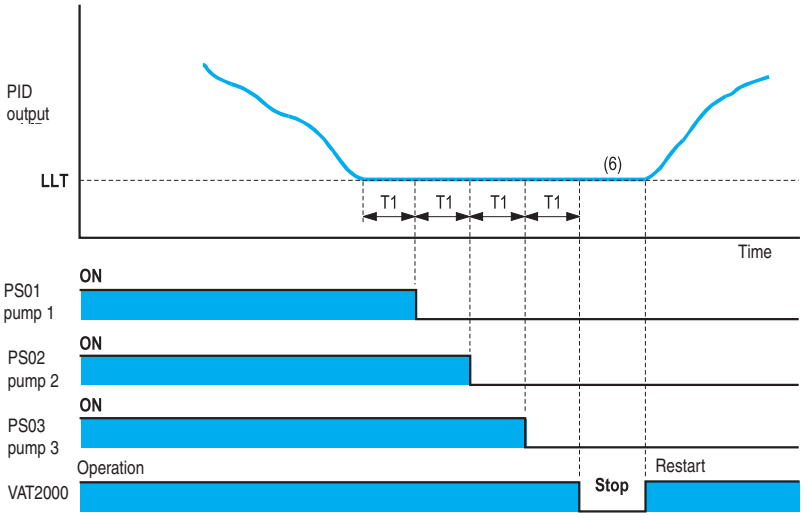




Operation and pump shift sequence



Stand-by status

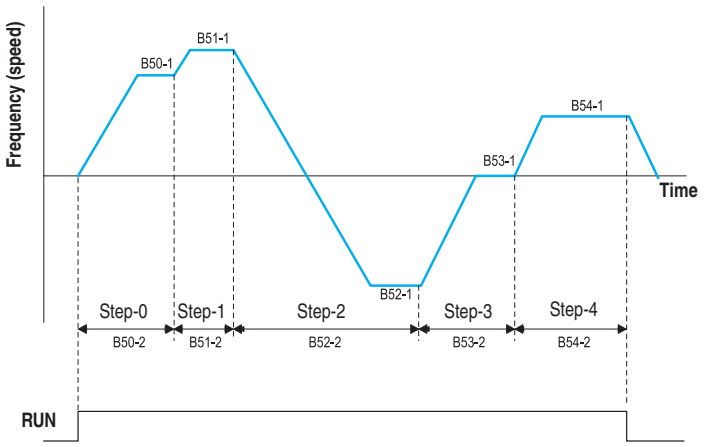


(1) Pump with shortest time operation
(2) Pump with longest time operation
(3) Pump with longest time operation
(4) Changeover ignored as time is less than adjusted in timer T1
(5) Pump with longest time operation is OFF if running time is over T2. A pump with shortest time operation in ON
(6) VAT2000 is stopped. Restart is automatically produced if PID leaves LLT level

T1 = Hold time
T2 = Continuous operation time limit
T3 = Changeover time

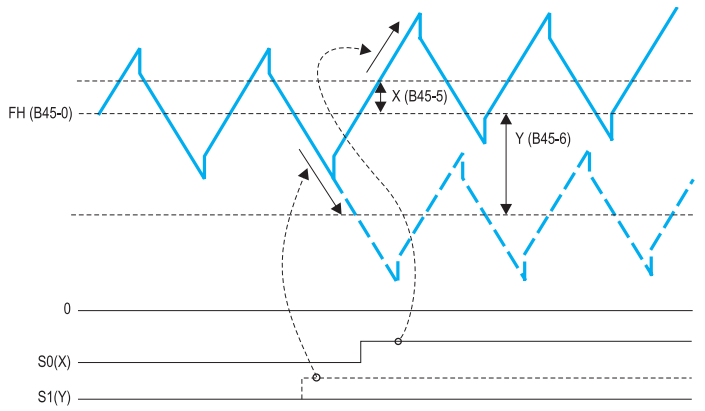
Pattern run

Up to ten steps automatic operation.
Useful for machines working in a repeated cycle.



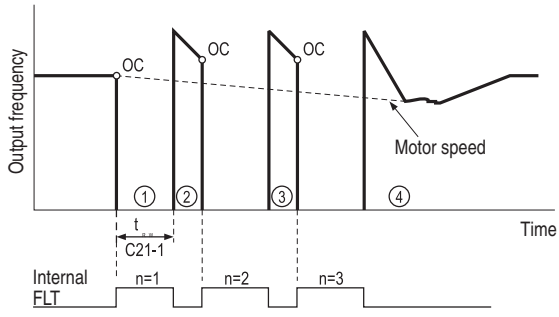
Traverse

Usefull function for winding textil equipment.
The traverse centre frequency, can be selected from either analog input setting, keypad setting or programmable fixed speeds.



Retry

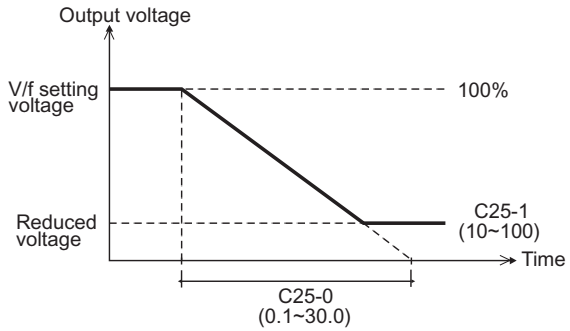
Allows automatic restart after a fault. Provides up to 10 programmable re-tries with programmable time between tries.

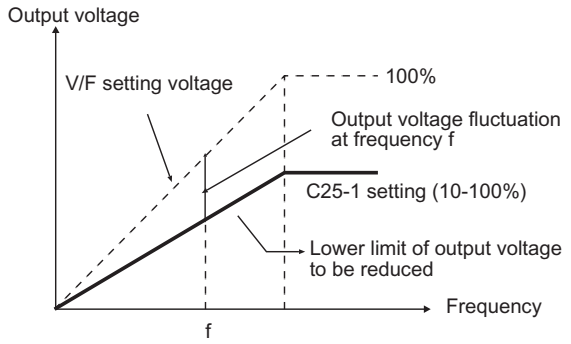


(1) Waiting time after trip by Overcurrent, oC
(2) (3) Pick-up and retry
(4) Pick-up achieved and retry finished

High efficiency operation (Energy saving)

During V/f constant operation, the non-load loss is large with motor unloaded or with a small load, and the motor efficiency drops remarcably. Thus, this function automatically decreases output voltage according to the load, improving motor efficiency.
Sliping may increase during high-efficiency operation so is recommended to use the automatic slip compensation. Autotuning will help for right adjustment.





Frequency jumps

By this function, the motor's mechanical resonance at a specific frequency can be skipped.

Communications

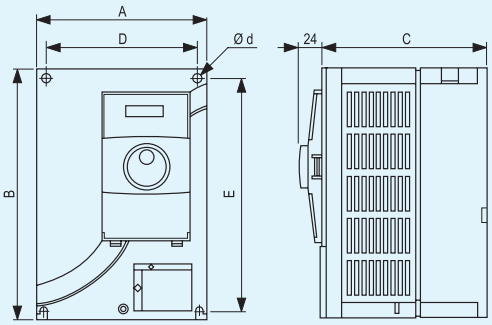
Built-in with RS485 port and ASCII communication protocol.
Optional Profibus DP interface.
Other communication interfaces in development.

Fault history

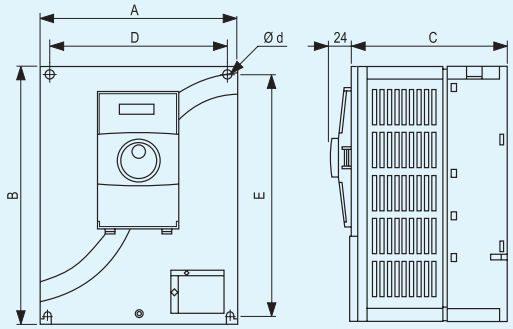
The last four faults are coded and saved in a internal buffer.

Dimensional drawings

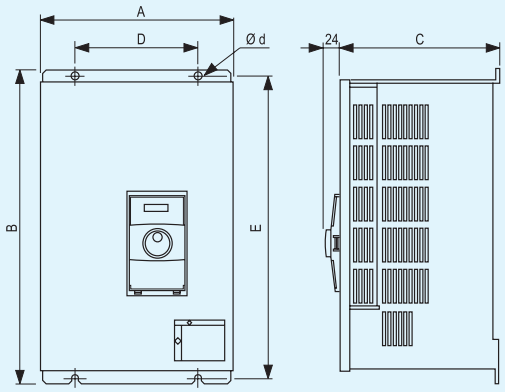
Dimensional drawings and weights



Cat. no. Supply 200-230V	Cat. no. Supply 380-460V	Dimensions (mm) A	B	C	D	E	Ød	Main circuit terminal	Weight (kg)
N00K4	X00K4	170	243	162	155	228	6	M4	3.5
N00K7	X00K7	170	243	162	155	228	6	M4	3.5
N01K5	X01K5	170	243	162	155	228	6	M4	3.5
N02K2	X02K2	170	243	162	155	228	6	M4	3.5
N04K0	X04K0	170	243	162	155	228	6	M4	3.5

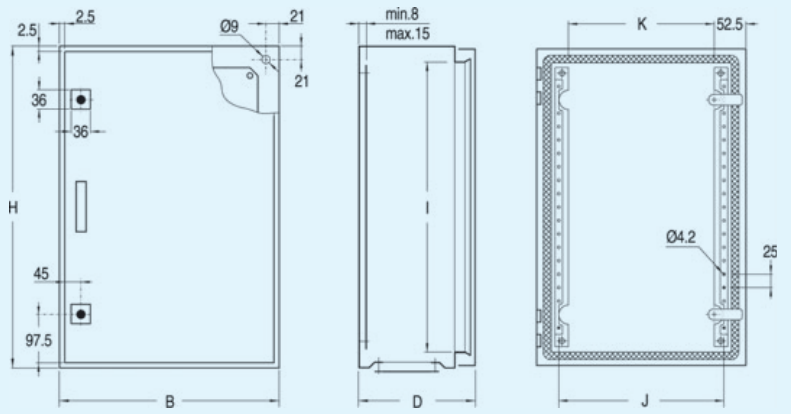


Cat. no. Supply 200-230V	Cat. no. Supply 380-460V	Dimensions (mm) A	B	C	D	E	Ød	Main circuit terminal	Weight (kg)
	X05K5	216	275	169	201	260	7	M4	6
	X07K5	216	275	169	201	260	7	M4	6
N05K5		216	275	169	201	260	7	M5	6
N07K5		216	275	169	201	260	7	M5	6
	X11K0	265	360	228	245	340	7	M5	13
	X15K0	265	360	228	245	340	7	M5	13
	X18K5	265	360	228	245	340	7	M5	13
N11K0		265	360	228	245	340	7	M6	13
N15K0		265	360	228	245	340	7	M6	13



Cat. no. Supply 200-230V	Cat. no. Supply 380-460V	Dimensions (mm) A	B	C	D	E	Ød	Main circuit terminal	Weight (kg)
	X22K0	310	500	253	200	480	10	M6	26
N18K5	X30K0	310	500	253	200	480	10	M8	26
N22K0		310	500	253	200	480	10	M8	26
N30K0		342	590	307	200	570	10	M8	55
	X37K0	342	590	307	200	570	10	M8	50
N37K0		342	590	307	200	570	10	M8	60
	X45K0	342	590	307	200	570	10	M8	50
	X55K0	420	690	309	300	686	10	M10	55
	X75K0	420	690	309	300	686	10	M10	60
	X90K0	480	740	352	400	714	10	M10	65
	X110K	480	740	352	400	714	10	M10	70
	X132K	488	980	358	320	956	13	M10	90
	X160K	488	980	358	320	956	13	M10	100
	X200K	680	1100	379	500	1070	15	M16	210
	X250K	870	1300	379	600	1270	15	M16	300
	X315K	870	1300	379	600	1270	15	M16	300

Dimensional drawings series IP54

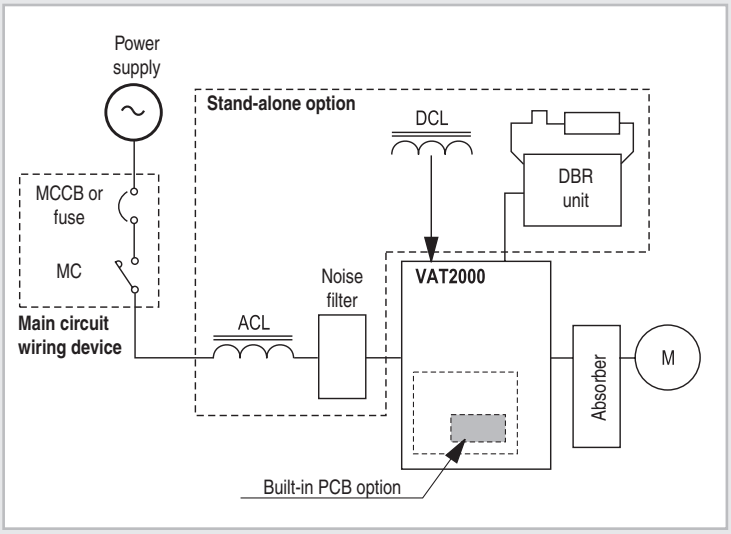


Dimensions (mm)				
H	B	D	K	J
600	400	250	290	326
600	600	300	490	526
800	600	400	490	526
1200	800	400	690	726

Series IP54 Cat. no.	Series IP20 Cat. no.	+	FeRIA WM cabinet
U2KX00K4SP54B	U2KX00K4S		
U2KX00K7SP54B	U2KX00K7S		
U2KX01K5SP54B	U2KX01K5S	+	**600 x 400 x 250** Ref. no.: 813015
U2KX02K2SP54B	U2KX02K2S		
U2KX04K0SP54B	U2KX04K0S		
U2KX05K5SP54B	U2KX05K5S	+	**600 x 600 x 300** Ref. no.: 813018
U2KX07K5SP54B	U2KX07K5S		
U2KX11K0SP54B	U2KX11K0S		
U2KX15K0SP54B	U2KX15K0S	+	**800 x 600 x 400** Ref. no.: 813182
U2KX18K5SP54B	U2KX18K5S		
U2KX22K0SP54B	U2KX22K0S	+	**800 x 600 x 400** Ref. no.: 813182
U2KX30K0SP54B	U2KX30K0S		
U2KX37K0SP54C	USKX37K0S		
U2KX37K0SP54V	U2KX37K0S	+	**1200 x 800 x 400** Ref. no.: 813185
U2KX45K0SP54C	U2KX45K0S		
U2KX45K0SP54V	U2KX45K0S		

IP54 enclosure includes in addition to drive, an EMC filter, enclosure's cooling fan and I/O terminals

External accessories



Stand-alone options

Noise filter	**U2KF-□□□□** **PR-□□□□**	This device supresses the elctromagnetic noise generated by the inverter. It may be required for EMC compliance (CE)
DBR unit	**U2KV23DBU-□□**	This module provides dynamic braking capacity to drives larger than 7.5kW (U2KN07K5S or U2KX07K5S). Always install appropriate braking resistor
ACL	**ACR-□□□□**	If the line impedance is too low the current ripple trough input rectifier become excessive and may result in inverter damage. This may happen when the power supply transformer exceeds 10 times the inverter unit capacity, so always install reactors in this case. Reactors are also effective improving the power factor and suppressing the current high harmonics. The power factor will be approx. 0.9.
DCL	**DCR-□□□□**	Same benefits than ACL reactors, note however that ACL provides additional protection to input rectifier
Surge absorber	**ACFR-□□□□ & N11P34018**	This device protects the motor against surge voltage. It is applicable to 400-460V systems, and may be required if output wiring to motor exceeds of 40m length. The surge absorver is composed by one output reactor and a RC filter

Constant torque ratings

VAT2000 Cat. No	Losses W	Fuses (1) (A)	MCCB (2) (A)	Series MC
U2KN00K4S	49	20	5	CL00
U2KN00K7S	62	20	5	CL00
U2KN01K5S	84	50	10	CL00
U2KN02K2S	117	60	15	CL00
U2KN04K0S	153	110	20	CL01
U2KN05K5S	215	125	30	CL02
U2KN07K5S	301	225	40	CL04
U2KN11K0S	420	225	75	CL04
U2KN15K0S	506	250	75	CL06
U2KN18K5S	708	400	100	CL07
U2KN22K0S	757	500	150	CL09
U2KN30K0S	1192	500	150	CL10
U2KN37K0S	1491	600	200	CK75
U2KX00K4S	63	10	5	CL00
U2KX00K7S	83	10	5	CL00
U2KX01K5S	111	20	5	CL00
U2KX02K2S	129	30	5	CL00
U2KX04K0S	175	50	15	CL00
U2KX05K5S	275	60	20	CL00
U2KX07K5S	345	90	30	CL02
U2KX11K0S	369	110	40	CL04
U2KX15K0S	481	125	40	CL04
U2KX18K5S	550	175	50	CL04
U2KX22K0S	675	225	50	CL06
U2KX30K0S	876	250	75	CL06
U2KX37K0S	945	300	100	CL07
U2KX45K0S	1175	400	100	CL09
U2KX55K0S	1558	400	150	CK75
U2KX75K0S	2020	500	200	CK08
U2KX90K0S	2509	700	300	CK85
U2KX110KS	3343	800	300	CK09
U2KX132KS	3906	800	350	CK09
U2KX160KS	4915	1200	400	CK95
U2KX200KS	6520	1600	500	CK10
U2KX250KS	7848	200	700	CK11
U2KX315KS	9026	2000	800	CK12

Variable torque ratings

VAT2000 Cat. No.	Losses W	Fuses (1) (A)	MCCB (2) (A)	Series MC
U2KN00K4S	62	20	5	CL00
U2KN00K7S	84	50	10	CL00
U2KN01K5S	117	60	15	CL00
U2KN02K2S	153	110	20	CL01
U2KN04K0S	215	125	30	CL02
U2KN05K5S	301	225	40	CL04
U2KN07K5S	420	225	75	CL04
U2KN11K0S	506	250	75	CL06
U2KN15K0S	708	400	100	CL07
U2KN18K5S	757	500	150	CL09
U2KN22K0S	1032	500	150	CL10
U2KN30K0S	1341	600	200	CK75
U2KN37K0S	1657	600	200	CK75
U2KX00K4S	83	10	5	CL00
U2KX00K7S	111	20	5	CL00
U2KX01K5S	129	30	5	CL00
U2KX02K2S	175	50	15	CL00
U2KX04K0S	275	60	20	CL00
U2KX05K5S	345	90	30	CL02
U2KX07K5S	369	110	40	CL04
U2KX11K0S	481	125	40	CL04
U2KX15K0S	550	175	50	CL04
U2KX18K5S	675	225	50	CL06
U2KX22K0S	876	250	75	CL06
U2KX30K0S	1080	300	100	CL07
U2KX37K0S	1104	400	100	CL09
U2KX45K0S	1437	400	150	CL09
U2KX55K0S	2091	500	200	CK75
U2KX75K0S	2473	700	300	CK08
U2KX90K0S	2998	800	300	CK85
U2KX110KS	3758	800	350	CK09
U2KX132KS	4637	1200	400	CK09
U2KX160KS	5566	1600	500	CK95
U2KX200KS	7266	2000	700	CK10
U2KX250KS	8745	2000	800	CK11
U2KX315KS	10061	2600	900	CK12

(1) To comply with UL with VAT2000, 400 series, use a Class J fuse
(2) Use MCCB with magnetic trip only

EMC filter	Dynamic braking module	Braking resistor (3)	Input AC AC reactor	DC reactor	Surge absorber (4) Reactor + RC filter
U2KF3016PR1	Built-in VAT2000	TLR405P200	ACR4A2H5	-	-
U2KF3016PR1	Built-in VAT2000	TLR216P200	ACR6A2H5	-	-
U2KF3016PR1	Built-in VAT2000	TLR108P200	ACR9A1H3	-	-
U2KF3030PR1	Built-in VAT2000	TLR74P200	ACR12A0H84	-	-
U2KF3030PR1	Built-in VAT2000	TLR44P600	ACR18A0H56	-	-
U2KF3060PR2	Built-in VAT2000	TLR29P600	ACR27A0H37	DCR32A0H78	-
U2KF3060PR2	Built-in VAT2000	TLR22P600	ACR35A0H27	DCR45A0H55	-
U2KF3094PR3	U2KV23DBUL1	TLR15P1000	ACR55A0H18	DCR60A0H4	-
U2KF3094PR3	U2KV23DBUL1	TLR11P1200	ACR70A0H14	DCR80A0H3	-
PR3120STD	U2KV23DBUL1	TLR8,8P1500	ACR80A0H14	DCR100A0H24	-
PR3120STD	U2KV23DBUL2	TLR7,4P1800	ACR97A0H11	DCR120A0H2	-
PR3150STD	U2KV23DBUL2	TLR5P2500	ACR140A0H072	DCR150A0H17	-
PR3180STD	U2KV23DBUL3	TLR4P3000	ACR180A0H056	DCR180A0H14	-
U2KF3016PR1	Built-in VAT2000	TLR864P200	ACR3A8H1	-	ACFR10A + N11P34018
U2KF3016PR1	Built-in VAT2000	TLR864P200	ACR3A8H1	-	ACFR10A + N11P34018
U2KF3016PR1	Built-in VAT2000	TLR432P200	ACR4A5H1	-	ACFR10A + N11P34018
U2KF3016PR1	Built-in VAT2000	TLR295P200	ACR6A3H4	-	ACFR10A + N11P34018
U2KF3016PR1	Built-in VAT2000	TLR175P600	ACR10A2H	-	ACFR10A + N11P34018
U2KF3032PR2	Built-in VAT2000	TLR118P600	ACR14A1H4	DCR18A2H9	ACFR14A + N11P34018
U2KF3032PR2	Built-in VAT2000	TLR86P600	ACR18A1H1	DCR25A2H1	ACFR18A + N11P34018
U2KF3058PR3	U2KV23DBUH1	TLR59P1000	ACR27A0H75	DCR32A1H6	ACFR27A + N11P34018
U2KF3058PR3	U2KV23DBUH1	TLR43P1000	ACR35A0H58	DCR40A1H2	ACFR35A + N11P34018
U2KF3058PR3	U2KV23DBUH1	TLR35P1500	ACR38A0H58	DCR50A0H96	ACFR38A + N11P34018
U2KF3096PR4	U2KV23DBUH2	TLR29P1800	ACR45A0H45	DCR60A0H82	ACFR45A + N11P34018
U2KF3096PR4	U2KV23DBUH2	TLR22P2500	ACR70A0H29	DCR80A0H58	ACFR62A + N11P34018
PR3110STD	U2KV23DBUH3	TLR18P3000	ACR90A0H22	DCR100A0H49	ACFR90A + N11P34018
PR3150STD	U2KV23DBUH3	TLR15P3700	ACR115A0H18	DCR140A0H32	ACFR115A + N11P34018
PR3180STD	2 x U2KV23DBUH2	(5)	ACR115A0H18	DCR140A0H32	ACFR115A + N11P34018
PR3280STD	UADOPTDBUH0	(5)	ACR160A0H14	DCR180A0H25	ACFR160A + N11P34018
PR3280STD	UADOPTDBUH0	(5)	ACR185A0H11	DCR210A0H25	ACFR185A + N11P34018
PR3330STD	UADOPTDBUH0	(5)	ACR225A0H096	DCR270A0H18	ACFR225A + N11P34018
PR3380STD	UADOPTDBUH0	(5)	ACR300A0H067	DCR310A0H14	ACFR300A + N11P34018
PR3450STD	UADOPTDBUH0	(5)	ACR360A0H056	DCR400A0H13	ACFR360A + N11P34018
PR3600STD	UADOPTDBUH0	(5)	ACR460A0H056	DCR540A0H08	ACFR460A + N11P34018
PR3750STD	UADOPTDBUH0	(5)	ACR550A0H039	DCR650A0H07	ACFR550A + N11P34018
PR3900STD	UADOPTDBUH0	(5)	ACR625A0H035	DCR740A0H06	ACFR625A + N11P34018

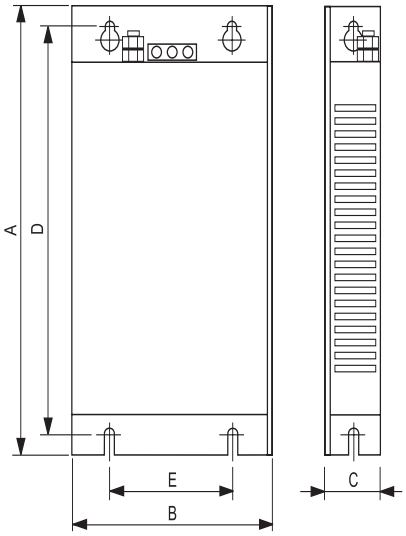
EMC filter	Dynamic braking module	Braking resistor (3)	Input AC reactor	DC reactor	Surge absorber (4) Reactor + RC filter
U2KF3016PR1	Built-in VAT2000	TLR405P200	ACR6A2H5	-	-
U2KF3016PR1	Built-in VAT2000	TLR216P200	ACR9A1H3	-	-
U2KF3016PR1	Built-in VAT2000	TLR108P200	ACR12A0H84	-	-
U2KF3030PR1	Built-in VAT2000	TLR74P200	ACR18A0H56	-	-
U2KF3030PR1	Built-in VAT2000	TLR44P600	ACR27A0H37	-	-
U2KF3060PR2	Built-in VAT2000	TLR29P600	ACR35A0H27	DCR45A0H55	-
U2KF3060PR2	Built-in VAT2000	TLR22P600	ACR55A0H18	DCR60A0H4	-
U2KF3094PR3	U2KV23DBUL1	TLR15P1000	ACR70A0H14	DCR80A0H3	-
U2KF3094PR3	U2KV23DBUL1	TLR11P1200	ACR80A0H14	DCR100A0H24	-
PR3120STD	U2KV23DBUL2	TLR8,8P1500	ACR97A0H11	DCR120A0H2	-
PR3150STD	U2KV23DBUL2	TLR7,4P1800	ACR140A0H072	DCR150A0H17	-
PR3150STD	U2KV23DBUL3	TLR5P2500	ACR180A0H056	DCR180A0H14	-
PR3180STD	U2KV23DBUL3	TLR4P3000	ACR200A0H051	DCR220A0H11	-
U2KF3016PR1	Built-in VAT2000	TLR864P200	ACR3A8H1	-	ACFR10A + N11P34018
U2KF3016PR1	Built-in VAT2000	TLR864P200	ACR4A5H1	-	ACFR10A + N11P34018
U2KF3016PR1	Built-in VAT2000	TLR432P200	ACR6A3H4	-	ACFR10A + N11P34018
U2KF3016PR1	Built-in VAT2000	TLR295P200	ACR10A2H	-	ACFR10A + N11P34018
U2KF3016PR1	Built-in VAT2000	TLR175P600	ACR14A1H4	-	ACFR14A + N11P34018
U2KF3032PR2	Built-in VAT2000	TLR118P600	ACR18A1H1	DCR25A2H1	ACFR18A + N11P34018
U2KF3032PR2	Built-in VAT2000	TLR86P600	ACR27A0H75	DCR32A1H6	ACFR27A + N11P34018
U2KF3058PR3	U2KV23DBUH1	TLR59P1000	ACR35A0H58	DCR40A1H2	ACFR35A + N11P34018
U2KF3058PR3	U2KV23DBUH1	TLR43P1000	ACR38A0H58	DCR50A0H96	ACFR38A + N11P34018
U2KF3058PR3	U2KV23DBUH2	TLR35P1500	ACR45A0H45	DCR60A0H82	ACFR45A + N11P34018
U2KF3096PR4	U2KV23DBUH2	TLR29P1800	ACR70A0H29	DCR80A0H58	ACFR62A + N11P34018
U2KF3096PR4	U2KV23DBUH3	TLR22P2500	ACR90A0H22	DCR100A0H49	ACFR90A + N11P34018
PR3150STD	U2KV23DBUH3	TLR18P3000	ACR90A0H22	DCR125A0H40	ACFR90A + N11P34018
PR3180STD	2 x U2KV23DBUH3	TLR15P3700	ACR115A0H18	DCR140A0H32	ACFR115A + N11P34018
PR3280STD	UADOPTDBUH0	(5)	ACR160A0H14	DCR180A0H25	ACFR160A + N11P34018
PR3280STD	UADOPTDBUH0	(5)	ACR185A0H11	DCR210A0H25	ACFR185A + N11P34018
PR3330STD	UADOPTDBUH0	(5)	ACR225A0H096	DCR270A0H18	ACFR300A + N11P34018
PR3380STD	UADOPTDBUH0	(5)	ACR300A0H067	DCR310A0H14	ACFR300A + N11P34018
PR3450STD	UADOPTDBUH0	(5)	ACR360A0H056	DCR400A0H13	ACFR360A + N11P34018
PR3600STD	UADOPTDBUH0	(5)	ACR460A0H056	DCR540A0H08	ACFR460A + N11P34018
PR3750STD	UADOPTDBUH0	(5)	ACR550A0H039	DCR650A0H07	ACFR550A + N11P34018
PR3900STD	UADOPTDBUH0	(5)	ACR625A0H035	DCR740A0H06	ACFR625A + N11P34018
PR3900STD	UADOPTDBUH0	(5)	ACR700A0H035	DCR800A0H06	ACFR700A + N11P34018

(3) External braking resistors for 100% braking torque, 10% ED.
Drives up to U2KN07K5S y U2KX07K5S include a small built-in braking resistor. Check product manual for appropriate usage.

(4) Both output reactor and RC filter are required to absorb surge voltage which may be produced on motor side.

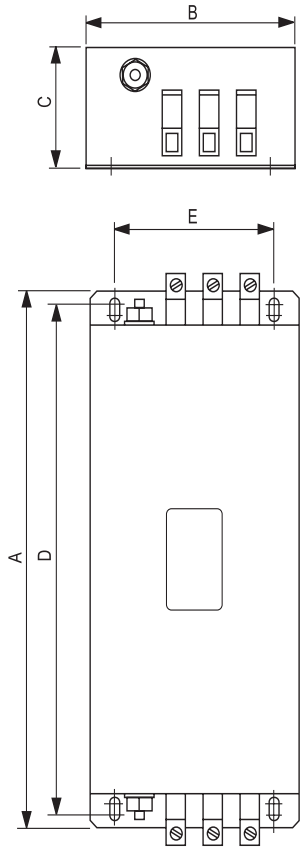
(5) Ask your dealer for accessories of drives above U2KX45__.

EMC foot-print filters



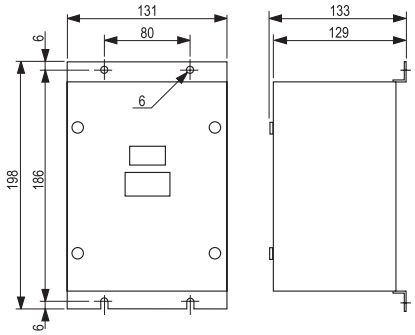
Cat. No.	Ref. no.	Current	Dimensions (mm)						Input	Weight
		(A)	A	B	C	D	E	M.	terminal	(kg)
U2KF3016PR1	167832	16	288	175	51	273	100	M5	10mm²	1.5
U2KF3030PR1	167833	30	288	175	51	273	100	M5	10mm²	1.5
U2KF3032PR2	167834	32	320	221	51	305	150	M5	10mm²	1.9
U2KF3058PR3	167835	58	427	275	66	402	225	M5	25mm²	4.4
U2KF3060PR2	167836	60	320	221	51	305	150	M5	25mm²	2.6
U2KF309PRD3	167837	94	427	275	66	402	225	M5	35mm²	5.1
U2KF3096PR4	167838	96	575	312	67	549	200	M5	35mm²	6.1

EMC stand-alone filters



Cat. No.	Ref. no.	Current	Dimensions (mm)						Input	Weight
		(A)	A	B	C	D	E	M.	terminal	(kg)
PR3110STD	167978	110	400	170	90	373	130	M6	50mm²	15
PR3120STD	167979	120	400	170	90	373	130	M6	50mm²	15
PR3150STD	167980	150	510	180	115	470	156	M8	95mm²	17
PR3180STD	167981	180	510	180	115	470	156	M9	95mm²	17
PR3280STD	167982	280	700	260	130	660	230	M8	150mm²	37
PR3330STD	167983	330	790	300	150	600	280	M8	Bar 25x6	48
PR3380STD	167984	380	790	300	150	600	280	M8	Bar 25x6	50
PR3450STD	167985	450	790	300	150	600	280	M8	Bar 25x6	50
PR3600STD	167986	660	790	300	150	600	280	M8	Bar 30x8	80
PR3750STD	167987	750	680	430	215	450	400	M10	Bar 40x10	80
PR3900STD	167988	900	680	430	215	450	400	M10	Bar 40x10	90

External dynamic braking units



The VAT2000 includes a dynamic braking feature in drives up to U2KN07K5S and U2KX07K5S as standard.
For larger drives the dynamic braking is performed by using the external module U2KV23DBU.
Remark: For larger drives from U2KX45__, please ask your dealer.

Cat. No.	Ref. no.	Weight (kg)
U2KV23DBUL1	168098	1.7
U2KV23DBUL2	168099	1.7
U2KV23DBUL3	168100	1.7
U2KV23DBUH1	168084	1.7
U2KV23DBUH2	168085	1.7
U2KV23DBUH3	168086	1.7

Braking resistors

Fig. 1
Resistors with terminals for

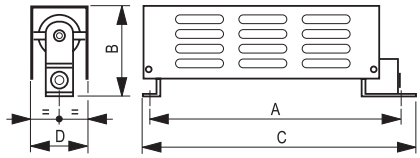
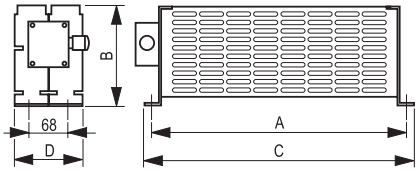


Fig. 2
Resistors with terminals for



A small capacity braking resistor is included in drives up to U2KN07K5S and U2KX07K5S as standard. Check User's Manual for appropriate usage.
The external braking optional resistors for 100% braking capacity, 10% ED are shown in below table:

Cat. No.	Ref. no.	Fig.	Dimensions (mm)				Weight
			A	B	C	D	(kg)
TLR405P200	129867	1	195	65	210	60	0.6
TLR216P200	129868	1	195	65	210	60	0.6
TLR108P200	129869	1	195	65	210	60	0.6
TLR74P200	129870	1	195	65	210	60	0.6
TLR44P600	129166	1	450	95	465	60	1.2
TLR29P600	129167	1	450	95	465	60	1.2
TLR22P600	129168	1	450	95	465	60	1.2
TLR15P1000	129169	1	450	100	465	70	1.8
TLR11P1200	129170	1	450	120	465	75	2.4
TLR8,8P1500	129171	2	440	100	460	140	2.2
TLR7,4P1800	129172	2	440	100	460	140	3.4
TLR5P2500	129871	2	440	180	460	140	3.2
TLR4P3000	129872	2	440	180	460	140	5.5
TLR864P200	129873	1	195	65	210	60	0.6
TLR432P200	129875	1	195	65	210	60	0.6
TLR295P200	129876	1	195	65	210	60	0.6
TLR175P600	129173	1	450	95	465	60	1.2
TLR118P600	129174	1	450	95	465	60	1.2
TLR86P600	129175	1	450	95	465	60	1.2
TLR59P1000	129176	1	450	100	465	70	1.8
TLR43P1000	129177	1	450	100	465	70	1.8
TLR35P1500	129877	2	440	100	460	140	2.2
TLR29P1800	129878	2	440	100	460	140	3.4
TLR22P2500	129879	2	440	180	460	140	3.2
TLR18P3000	129880	2	440	180	460	140	5.5
TLR15P3700	129881	2	440	180	460	140	5.8

AC Input reactors

Fig. 1

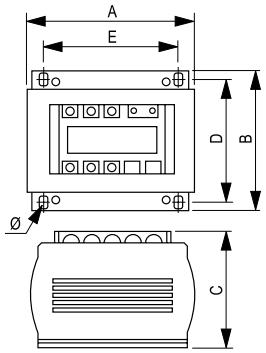


Fig. 2

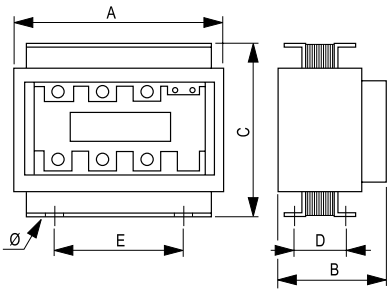
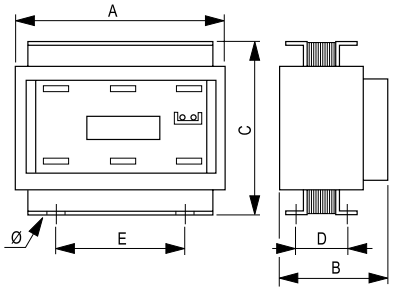


Fig. 3



Cat. No.	Ref. no.	Losses (W)	Fig.	Dimensions (mm)						Weight (kg)
				A	B	C	D	E	Ø	
ACR4A2H5	129978	9	1	137	146	103	125	102	7	2.9
ACR6A2H5	129979	11	1	137	146	103	125	102	7	3.2
ACR9A1H3	129980	14	1	137	146	113	125	102	7	4
ACR12A0H84	129981	19	1	173	167	118	146	127	7	8
ACR18A0H56	129982	21	1	173	167	133	146	127	7	10
ACR27A0H37	129983	23	1	205	200	145	176	174	7	12
ACR35A0H27	129984	25	1	205	200	155	176	174	7	13
ACR55A0H18	129985	28	1	205	200	155	176	174	7	13
ACR70A0H14	129986	32	2	280	190	210	80	250	9	20
ACR80A0H14	129987	35	2	280	190	210	80	250	9	20
ACR97A0H11	129988	39	2	280	190	210	80	250	9	20
ACR140A0H072	129925	40	3	280	220	210	90	250	9	22
ACR180A0H056	129926	42	3	280	230	210	100	250	9	27
ACR200A0H051	129927	47	3	280	245	210	115	250	9	29
ACR3A8H1	129989	8	1	137	146	103	125	102	7	2.8
ACR4A5H1	129990	9	1	137	146	103	125	102	7	2.9
ACR6A3H4	129991	11	1	137	146	103	125	102	7	3.2
ACR10A2H	129992	14	1	137	146	113	125	102	7	4
ACR14A1H4	129993	19	1	173	167	118	146	127	7	8
ACR18A1H1	129994	21	1	173	167	133	146	127	7	10
ACR27A0H75	129995	23	1	205	200	145	176	174	7	12
ACR35A0H58	129996	25	1	205	200	155	176	174	7	13
ACR38A0H58	129997	32	1	205	200	170	176	174	7	14
ACR45A0H45	129998	35	1	205	200	170	176	174	7	14
ACR70A0H29	129928	40	2	280	200	210	90	250	9	22
ACR90A0H22	129700	42	2	280	210	210	100	250	9	27
ACR115A0H18	129701	47	2	280	225	210	115	250	9	29
ACR160A0H14	129702	51	3	340	230	265	106	310	9	38
ACR185A0H11	129703	53	3	340	250	265	126	310	9	43
ACR225A0H096	129704	58	3	340	250	265	126	310	9	45
ACR300A0H067	129705	75	3	410	320	315	136	380	9	81
ACR360A0H056	129706	78	3	410	320	315	136	380	9	86
ACR460A0H056	129707	107	3	490	340	365	142	460	9	97
ACR550A0H039	129708	110	3	490	340	365	142	460	9	98
ACR625A0H035	129709	120	3	490	340	365	142	460	9	101
ACR700A0H035	168285	130	3	490	340	365	142	460	9	105

DC Reactors

Fig. 1

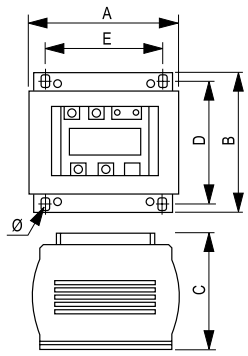
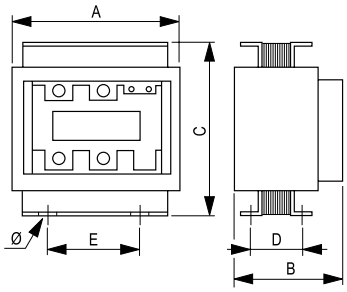


Fig. 2



Cat. No.	Ref. no.	Losses (W)	Fig.	Dimensions (mm)						Weight (kg)
				A	B	C	D	E	Ø	
DCR32A0H78	168371	13	4	150	200	145	176	102	7	7
DCR45A0H55	168372	13	4	150	200	145	176	102	7	7
DCR60A0H4	168373	14	4	150	200	155	176	102	7	8
DCR80A0H3	168374	17	4	150	200	170	176	102	7	9
DCR100A0H24	168375	17	4	150	200	170	176	102	7	9
DCR120A0H2	168376	17	5	190	200	215	90	160	9	15
DCR150A017	168377	21	5	190	210	215	100	160	9	17
DCR180A0H14	168378	26	5	240	200	265	96	210	9	21
DCR220AH11	168379	27	5	240	200	265	96	210	9	21
DCR18A2H9	168380	13	4	125	167	118	146	89	7	5
DCR25A2H1	168381	14	4	125	167	118	146	89	7	5
DCR32A1H6	168382	15	4	125	167	133	146	89	7	6
DCR40A1H2	168383	17	4	125	167	133	146	89	7	6
DCR50A0H96	168384	16	4	150	200	145	176	102	7	7
DCR60A0H82	168385	17	4	150	200	155	176	102	7	8
DCR80A0H58	168386	21	4	150	200	170	176	102	7	9
DCR100A0H49	168286	23	4	150	200	170	176	102	7	9
DCR125A0H40	168287	27	5	190	200	215	90	160	9	15
DCR140A0H32	168288	29	5	190	200	215	90	160	9	15
DCR180A0H25	168289	33	2	250	230	300	106	210	9	25
DCR210A0H25	168290	35	2	250	240	300	126	210	9	27
DCR270A0H18	168291	37	2	250	250	300	136	210	9	28
DCR310A0H14	168292	39	2	250	250	300	136	210	9	31
DCR400A0H13	168293	42	2	300	270	350	116	260	11	55
DCR540A0H08	168294	49	2	300	300	350	136	260	11	56
DCR650A0H07	168295	50	2	300	300	350	136	260	11	57
DCR740A0H06	168296	51	2	300	300	350	136	260	11	58
DCR800A0H06	168297	52	2	300	300	350	136	260	11	60

Surge absorber

Reactor

Fig. 1

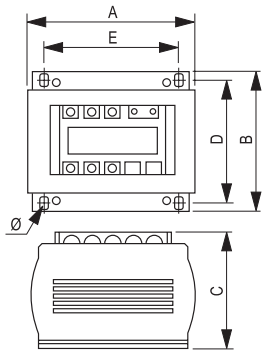
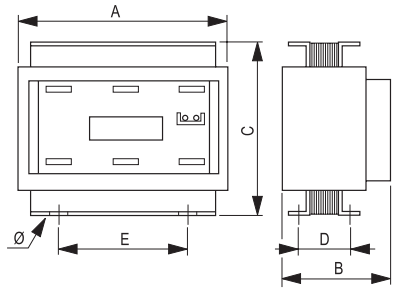
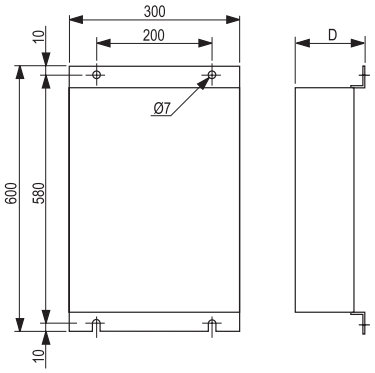


Fig. 2



Cat. No.	Ref. no.	Losses (W)	Fig.	Dimensions (mm)						Weight (kg)
				A	B	C	D	E	Ø	
ACFR10A	168471	9	1	137	146	103	125	102	7	2.9
ACFR14A	168472	14	1	137	146	113	125	102	7	4
ACFR18A	168473	18	1	173	167	120	146	127	7	9
ACFR27A	168474	19	1	173	167	120	146	127	7	9
ACFR35A	168475	20	1	173	167	133	146	127	7	10
ACFR38A	168476	21	1	173	167	133	146	127	7	10
ACFR45A	168477	32	1	205	200	160	176	174	7	12
ACFR62A	168478	32	1	205	200	170	176	174	7	14
ACFR90A	168479	42	2	280	230	210	100	250	9	24
ACFR115A	168480	44	2	280	245	210	115	250	9	27
ACFR160A	168481	51	2	340	230	265	106	310	9	40
ACFR185A	168482	53	2	340	250	265	126	310	9	45
ACFR225A	168483	78	2	410	300	315	116	380	9	80
ACFR300A	168484	80	2	410	320	315	136	380	9	86
ACFR360A	168485	120	2	490	360	365	162	460	9	124
ACFR460A	168486	140	2	560	360	415	120	520	11	140
ACFR550A	168487	160	2	560	380	415	160	520	11	155
ACFR625A	168488	175	2	700	400	520	150	660	11	172
ACFR700A	168489	190	2	700	420	520	170	660	11	193

RC Filter



Cat. No.	Ref. no.	Losses (W)	Max. carrier frequency	Dimens. D	Weight (kg)
N11P3401806	168260	1470	8	275	14
N11P3401807	168261	297	4	135	8

Dimensions in mm